



# Portable Air Conditioners

## Model KWV-20

**SETUP, OPERATION, AND MAINTENANCE MANUAL**  
**20 TON PORTABLE VERTICAL AIR CONDITIONING UNIT**



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KWV-20G\*ATA\*\*  
REV — 02/26/20

# Koldwave

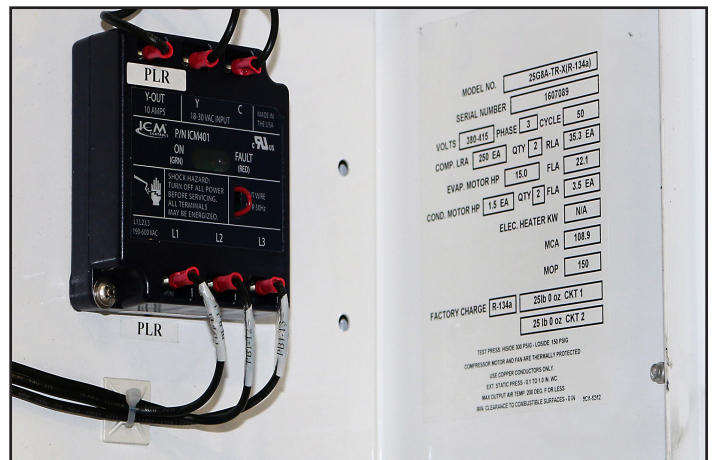
MODEL NO.	HKW30G3ATA60-TR		
SERIAL NUMBER	1610057		
VOLTS	208/230	PHASE	3
		CYCLE	60
COMP. LRA	351 EA	QTY	2
		RLA	53.6 EA
EVAP. MOTOR HP	15.0	FLA	35
COND. MOTOR HP	3.0 EA	QTY	2
		RLA	8.6 EA
ELEC. HEATER KW	60		
MCA	240.8		
MOP	250		
FACTORY CHARGE	R-410A	46 lb 0oz CKT1	
		46 lb 0oz CKT2	

TEST PRESS. HISIDE 500 PSIG - LOSIDE 250 PSIG  
 COMPRESSOR MOTOR AND FAN ARE THERMALLY PROTECTED  
 USE COPPER CONDUCTORS ONLY.  
 EXT. STATIC PRESS - 0.1 TO 1.0 IN. WC.  
 MAX OUTPUT AIR TEMP. 200 DEG. F OR LESS  
 MIN. CLEARANCE TO COMBUSTIBLE SURFACES - 0 IN

9CA-6242

## IDENTIFICATION OF YOUR PORTABLE UNIT

The Data Tag contains important information on how identify your Koldwave Unit. See Figure 1 for more information on locating tag.



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### DRAWINGS AND SCHEMATICS

Wiring Diagram: CA6176P11\*

Product Drawing: CA3127 (H)\*

<b>WARNING: HIGH VOLTAGE – DISCONNECT POWER BEFORE SERVICING</b>	
<b>DISCONNECT POWER</b> Failure to disconnect power before servicing could lead to severe personal injury or death.	<b>RE-CONNECT ALL GROUNDS</b> All parts of this product capable of conducting electrical current are grounded. If grounding wires, screws, straps, clips, nuts, or washers used to complete a path to ground are removed for servicing, they must be reconnected at their original location.

# SPECIFICATIONS

## COOLING MODE

Entering Air Dry Bulb .....	80°F
Entering Air Wet Bulb .....	67°F
Outdoor Ambient.....	95°F
Total.....	250, 840 Btuh
Sensible .....	170, 620 Btuh
Operating range.....	65°F – 115°F

## POWER REQUIREMENTS

Voltage / Phasing / Frequency.....	208/230-3-60
Minimum Circuit Ampacity .....	(Amps) 106.4
Maximum Overcurrent Protective Device .....	125

## COMPRESSOR

Quantity / Type .....	2 .....	Scroll
Voltage / Phasing / Frequency.....	208/230-3-60	
RLA .....	(Amps) .....	35.2
LRA .....	(Amps) .....	250

## CONDENSER BLOWER MOTOR

(Quantity) / Horsepower .....	Quantity 2 .....	5 hp
Voltage / Phasing / Frequency .....	208-3-60	
FLA .....	(Amps) .....	13.6A
Design Condenser Air Flow .....	12,400 CFM	

## EVAPORATOR BLOWER MOTOR

Horsepower .....	5 hp	
Voltage / Phasing / Frequency.....	208-2-60	
FLA.....	(Amps) .....	13.6A
Evaporator Design Air Flow .....	8,000 CFM	

## REFRIGERANT

Compressor 1 .....	R-410a .....	25 lbs.
Compressor 2 .....	R-410a .....	25 lbs.
Low Pressure .....	75 PSIG Cutout .....	Auto Reset
High Pressure.....	650 PSIG Cutout.....	Manual Reset
Suction Operating Pressure .....	25 PSIG Low <sup>1</sup> .....	45 PSIG High <sup>1</sup>
Discharge Operating Pressure .....	90 PSIG Low <sup>1</sup> .....	300 PSIG High <sup>1</sup>
Superheat .....	@ approx. 80 °F ambient.....	15°F <sup>1</sup>
Subcooling .....	@ approx. 80 °F ambient.....	10°F <sup>1</sup>

## DIMENSIONS AND WEIGHT

Height/Width/Length.....	Refer to Product Drawing.....	See Appendix
Weight .....	2250 lbs.	

\*Readings are dependent upon ambient conditions; numbers listed are approximate

## INSPECTION OF EQUIPMENT

Upon receipt of unit, inspect for visible or concealed damage. Report any damage to the carrier and file a damage claim.

## MOUNTING THE EQUIPMENT

The unit is a self-contained air cooled system. It should be mounted on a level surface.

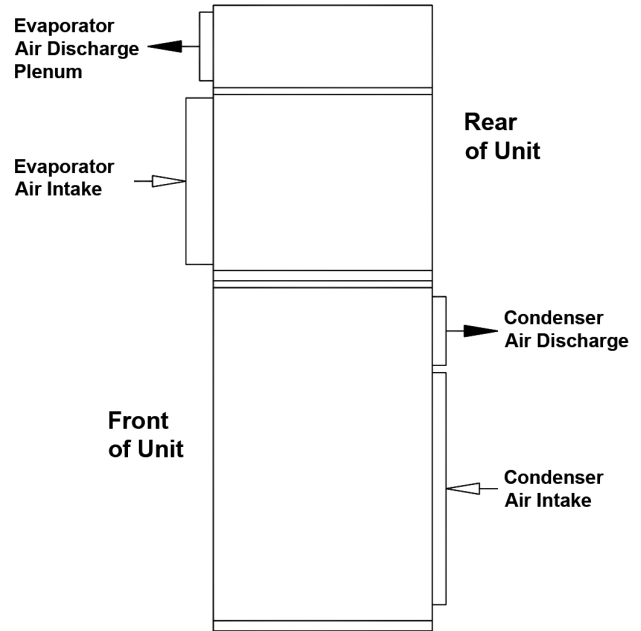
## INSTALLATION OF UNITS

The standard configuration of the portable vertical unit is shown in Figure 1 - Standard Portable.

1. The unit shall be shipped as a single packaged unit.
2. The unit is fully charged with R410A when shipped.
3. The unit is provided with forklift pockets at the bottom for moving the unit to the desired location for installation.
4. Connect the condensate drain line for the unit. A “kazoo” tube is shipped loose with the unit. Run hose from the condensate drain connection to the desired condensate disposal location and attach the “kazoo” tube to the end of the hose.

**NOTE:** The “kazoo” tube acts as a condensate trap and is required.

5. Refer to the unit data plate for main power requirements. Electrical wiring and grounding must be installed in accordance with the latest revision of the AS/NZS 3000 standard. Route the incoming power to the unit’s main power connection. **Make sure the power supplied to the unit matches the unit power requirements for this unit.**



**Figure 1 – Standard Portable**

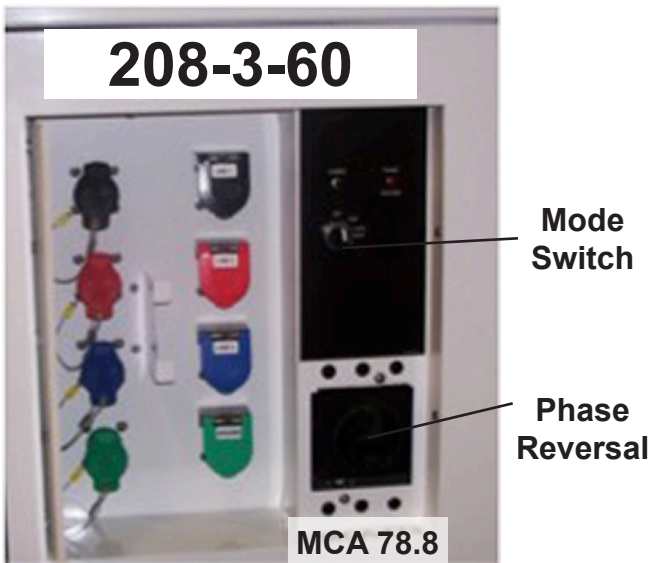
6. Install the tent material under the tent clamps on each side of the cabinet. A 7/16” wrench is required to loosen the bolts securing the tent clamps.

**NOTE:** Do not over-torque tent clamp bolts.

## OPERATING INSTRUCTIONS

Before electrical power is applied to the unit, make sure the unit is connected to an earth ground. The circuit breaker should be in the “OFF” position.

Electrical power is supplied to the unit from a power source (shore power or generator) via a connecting cable, which terminates in the factory supplied power connection. Connect the main power wires to the power connectors. See Figure 2 – Power Input Location. This supplies power to the entire unit. Make sure that the power that will be supplied to the unit matches the electrical data label provided in the unit.



**Figure 2 – Power Block Location**

Internal wiring connects the incoming power to a circuit breaker, which also serves as a service disconnect switch. Switching the breaker to the “ON” position supplies power to the unit.

Once the power is turned “ON”, proper sequencing of the three phase power input will be indicated by the lighting of the Phase Indicator Lamp (PIL). If the lamp is lit, change any two of the conductors (excluding the ground wire) at the power source. Do not change wiring internal to the unit! This unit will not run unless the phasing is correct.

**CONTROLS**

**Toggle Switch TS1 – Blower Control:**

When Toggle Switch TS1 is set to the ON position, the Supply Air Blower will operate continuously.

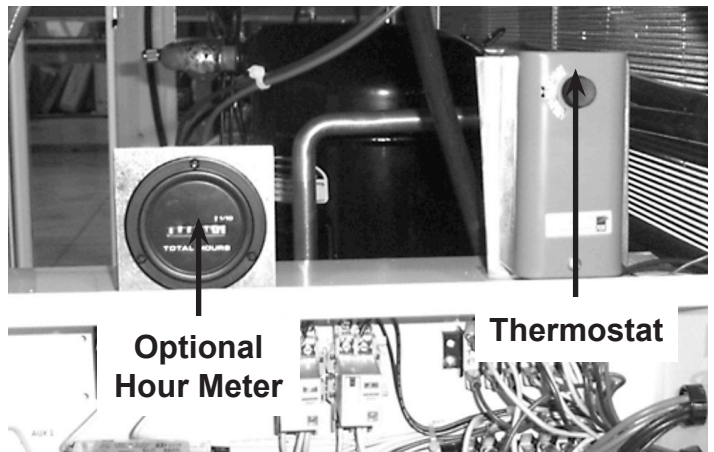
At this point the system must be controlled using either manual control or by the use of a thermostat.

**Selector Switch 1 (SS1)  
(Selection for Manual Control of Heat or Cool Modes)**

The Selector Switch 1 (SS1) is used to select the desired manual control mode for the unit. Set the selection to Thermostat Control when the Thermostat shall be used to control the conditioning of the air. Select Manual Cool when

1 to 2 stages of Manual Cooling is/are desired. Select Manual Heat when 1 to 2 stages of Manual Heating is/are desired. If Manual Cool or Manual Heat is selected, the appropriate switch must then be used to control the desired number of Heating or Cooling Stages desired.

**NOTE:** A time delay is built into the system to prevent Stage 1 and Stage 2 compressors from energizing simultaneously if two stages are desired to operate at the same time. This time delay is set to 5 minutes.



**Figure 3 - Thermostat**

**Thermostat Operation – Unit Mounted:**

1. Set Selector Switch SS1 to the desired mode of operation (COOL or HEAT).
2. Set the thermostat settings on the Penn A28 thermostat (see Figure 3 – Thermostat) to the desired temperature setting. Turn the Temperature dial to the desired temperature setting.
3. Stage 1 and Stage 2 cooling or heating will operate based upon the thermostat setting and the mode selected in Step 1.

When the space temperature rises approximately 1° F above the setting the system will turn “ON”. The differential between stages is approximately 2° F. The equipment will not cycle more than 6 times per hour in the cooling mode.

## UNIT COMPONENTS

### **Optional Deflection Registers**

The supply grilles are divided into 2 rows of manually adjustable louvers.

The horizontal louvers are in the front row. These are individually adjusted by hand.

The vertical louvers are the second or back row. Each section has a louver adjustment tab. The tab will adjust the vertical louvers as a section and can be moved with your finger.

### **Optional Hour Meter**

The unit may be equipped with an optional hour meter. This meter indicates the cumulative operating time of the system.

### **Sight Glass**

Each refrigerant circuit has a sight glass to determine that a liquid seal of refrigerant exists going to the expansion valve.

The sight glass also has a moisture indicator to detect the presence of moisture in the refrigerant. The indicator is yellow if moisture is present and green in color if there is no moisture.

If bubbles appear in the sight glass, the system is either undercharged with refrigerant or there may be a restriction in the liquid line upstream of the sight glass.

**NOTE:** Bubbles will occur for a minute or two when the compressor system starts. Bubbles will also be present during low ambient operation or on the 20-ton unit circuit 1 when the hot gas bypass is activated. Do not add charge to overcome bubbles for these reasons.

### **Access Fittings**

Each refrigerant circuit is provided with Schrader type access fittings. These can be used to adjust the refrigerant charge if necessary.

### **Air Flow**

The units are provided with an air proving switch. If air flow is not detected, the unit will not allow the cooling circuit to function. This protects in the case of a motor or belt failure.

### **Pressure Switches**

Each refrigerant circuit is provided with a High and a Low pressure switch. These are automatic reset type.

These units contain lockout relays that activate when the pressure switch(s) open the circuit. The main power to the unit must be switched Off and then On to reset the lock out relays

**CAUTION: Unit power should be turned off when doing any work on the unit when one or both of the pressure switches has been opened. Unit may start when the pressure switches automatically reset, thus causing a hazard to the service personnel.**

### **Hot Gas Bypass**

20-ton units have a Hot Gas Bypass valve on System 1. This valve helps keep the system running when the space load drops. It functions by artificially loading the evaporator with some hot discharge gas from the compressor into the inlet of the evaporator.

## MAINTENANCE

### **Bearings**

Motor and Blower bearings are permanently lubricated and require no maintenance.

### **Belts**

The condenser and evaporator blowers are belt driven and are provided with adjustable sheaves to change the speed. The drive belts should be examined periodically for wear and for correct tension. If the belts are too tight it can cause

bearing wear and a loose belt can cause slippage. If the two legs of the belt are pressed in, midway between the pulley and the sheave, and results in 1" to 1-1/2" of movement, the belt is tensioned properly. Belt tension can be adjusted by means of the adjusting bolt, which requires loosening a nut to move the motor to change belt position.

### **Filter Maintenance**

If the unit has disposable filters, inspect at least once a month and change as required. Access to the disposable filter is gained through the return air grille.

The unit may also contain optional cleanable filter(s) installed in the evaporator return air section. The return air grille must be removed to gain access to the filters. Check filters every few weeks to verify that the filters are clean.

After a period of use, dirt, lint, and the original water soluble adhesive coating are easily removed by simply flushing the filter in a stream of water.

Apply a new coating of adhesive, such as RP Super Filter Coat, to restore the filter characteristics.

### **FRESH AIR DAMPER - OPTIONAL**

This unit is supplied with an optional fresh air slide damper. The fresh air is introduced AFTER the DX coil, and is not conditioned.

refrigerant pressures. If the refrigerant pressure falls below 70 PSIG, the switch will open causing the compressor to shut off. As the pressure starts to rise above 100 PSIG, the switch will reset and allow the compressor to restart.

### **Thermostat**

The unit has a digital thermostat for one stage of cooling refer to the appendix at the end of the manual for operating instructions.

### **Time Delay (TD) – Compressor Short Cycling**

Single Phase units have a time delay relay that delays the start of the compressor for 5 minutes

when there is a call for cooling. Each single phase unit must have a time delay relay for compressor short cycling to prevent immediate restart after a brief operating period. If the compressor tries to restart due to constant space loading, mechanical loading due to un-equalized refrigerant system pressure would prevent the compressor from operating and over a period of time, could cause premature failure of the compressor. When the compressor becomes mechanically bound due to un-equalized pressures, the motor windings heat up which cause the compressor to trip on thermal overload.

## **REFRIGERATION SYSTEM COMPONENTS**

### **Compressor**

The compressor is scroll hermetic type. The function of the compressor is to create a differential in refrigerant pressure. It converts low pressure, low temperature refrigerant vapor entering the suction side of the compressor into a high pressure, high temperature gas at the discharge side of the compressor. The function of the compressor also pumps the refrigerant through the piping and components within the refrigeration system.

### **Condenser Coil**

The condenser receives the high-pressure high-temperature gas from the compressor after it passes through the vibration eliminator. As the condenser blower draws the ambient air across the fins and tubes of the condenser coil and the high-pressure high-temperature gas enters the condenser coil, the gas starts to condense back into liquid state. At the outlet piping of the condenser coil, the gas has been turned back into liquid refrigerant and flows toward the receiver.

### **Evaporator Coil**

As the liquid refrigerant passes through the expansion valve, the liquid refrigerant's pressure is regulated downward. This significant change



in pressure causes a drop in temperature of the refrigerant. When the warmer ambient air is drawn over the cooler evaporator coil, the warmer or latent heat is exchanged. As the heat is being exchanged, the exchange of heat energy causes the liquid refrigerant to boil into a vapor and greatly reducing the temperature of the air on the outlet side of the coil. The liquid refrigerant is converted into the lower temperature, lower pressure refrigerant causing it to changing into a vapor state.

### **Filter Drier**

The filter drier, filters loose particles, moisture and possible brazing residue from the system. If the unit starts tripping on low pressure cutout and the refrigerant line is frosted up to the outlet of the filter drier, check the refrigerant pressure drop across the filter drier and replace the filter drier if necessary.

### **Sight Glass**

A liquid sight glass is located before the liquid line solenoid valve. During the cooling mode of operation, pure liquid should flow through the liquid sight glass. The liquid refrigerant will appear clear enough to see the back of the inside of the sight glass. Flashing (bubbles) will appear in the sight glass during the first minute or two of operation until the expansion valve fully adjusts. If flashing is constant during the cooling mode, it may be an indication the unit is short of refrigerant. There may also be some flashing during hot gas bypass operation. See the Troubleshooting Chart for further details.

### **Thermostatic Expansion Valve**

The expansion valve regulates the amount of liquid refrigerant entering into the evaporator. As the liquid enters into the expansion valve, the valve will start to change the state by changing the pressure of the liquid refrigerant as it passes through and starts to enter the evaporator coil. When the environments load conditions start

to change, the bulb recognizes a change in temperature at the outlet piping of the evaporator to the suction side of the compressor and automatically adjusts the valve to maintain the correct flow into the evaporator coil.

## **ROUTINE MAINTENANCE**

To keep the Portable Air Conditioner unit operating safely and efficiently, it is recommended that a qualified service technician check the entire system at least once a year. Check the system more frequently depending on use and surrounding conditions.

### **Filters**

It is very important to keep the air filters clean. Be sure to inspect them at least once each month when the system is in constant operation. The PAC4 unit typically has a cleanable air filter. Remove the filter and use a brush to brush caked on dust from the filter. Next, use a stream of warm water to rinse remaining dust from the filter then reinstall.

If the unit is equipped with disposable type air filters, replace them with the same type and size.

**NOTE:** Do not attempt to clean disposable air filters.

### **Condenser Coil**

Inspect the condenser coil. If the condenser coil is dirty, clean with a stream of cold water, and pressurized air not exceeding 50 psig, or vacuum cleaner. Do not use hot water or steam, which can cause excessive high pressure in the refrigerant system. Clean the condenser coil in the opposite direction of the airflow.

### **Blower and Motor Drive Components**

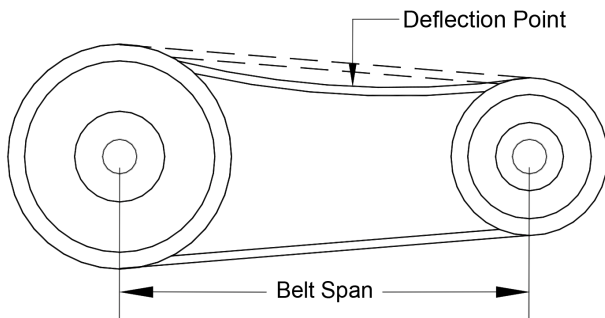
The Evaporator and Condenser Blower Bearings are pre-greased and sealed and require no maintenance. The evaporator and condenser fan motors may require oil on both bearing ends

however; the motors may also be sealed from servicing so if they are, then the bearings are permanently lubricated. Check for oil plugs at the top of the motor on each end of the motor over the bearing area. If there are oil plugs, the motor requires oiling. Each motor requires ten (10) droplets of SAE 5W 30 oil after every 2-3 years of normal operation.

**CAUTION: Over lubricating will cause the bearing to overheat and could cause the bearing seal to blow out.**

### Belt Tensioning

Excessive belt tension is the number one cause for blower and motor bearing failure. Proper belt tension and pulley alignment are essential for trouble free operation. Insufficient deflection indicates that the belt tension is entirely too tight, and if not loosened somewhat, noise due to excessive vibration, premature bearing failure, shortened belt life, and a reduction in fan performance may result. **Deflection** is the amount the belt gives when force is applied, usually by finger, to the belt at the approximate center point to the belt span. Tight belts may also overload the motor and cause the efficiency drop considerably or even premature motor failure as well. **Belt Span** is the distance in inches between the drive shaft center point and the fan shaft center point. Refer to Figure 7 – Belt Tensioning below.



**Figure 7 – Belt Tensioning**

Excessive deflection is an indication that the belt is not tight enough. If not corrected, slippage may occur causing loss of blower speed and belt failure. The belts will glaze then crack or even break due to increased temperatures caused by slippage. Belts may slip during start-up, but slipping should stop as soon as the fan reaches full speed. For proper tensioning, an excellent method to use is listed in the equation below. Belt span is in inches.

$$\text{Deflection} = \frac{\text{Belt Span}}{64}$$

Check the sheave alignment to make sure that the sheave faces are in the same plane. Check this by placing a straight edge across the face of the sheaves. Any gap between the edge and sheave faces indicates misalignment.

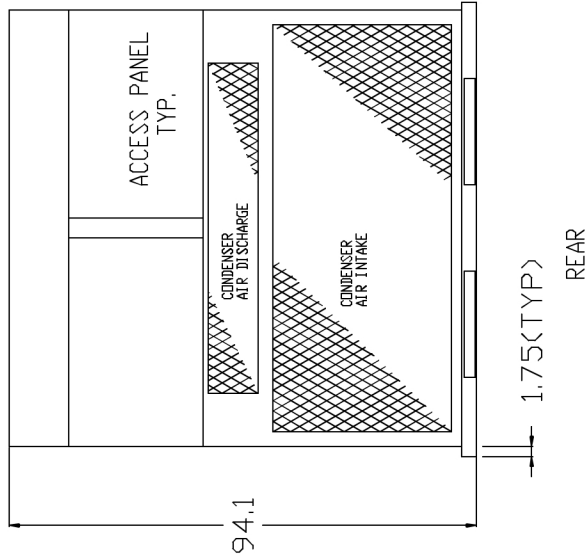
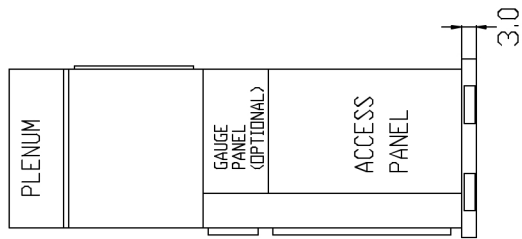
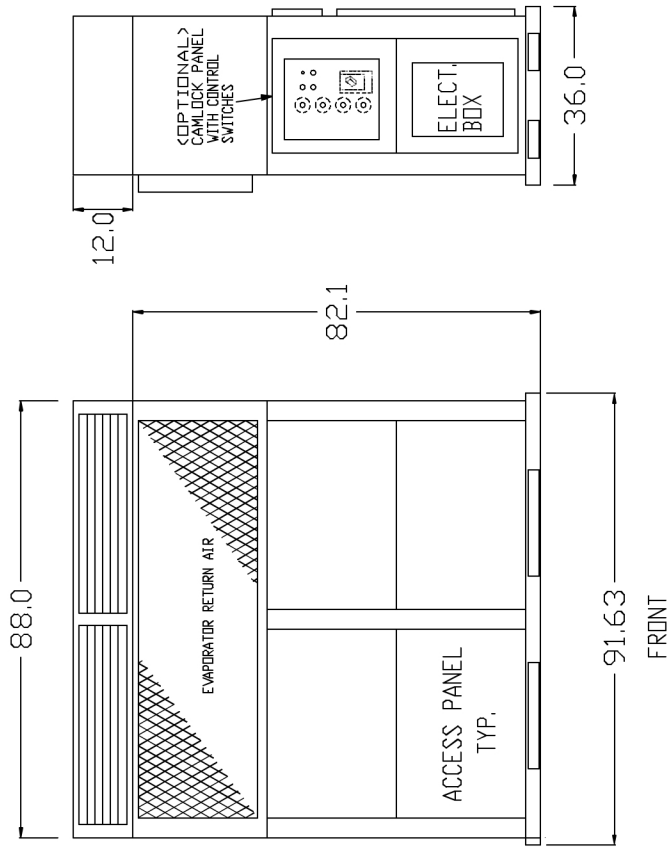
**CAUTION: This method is only valid when the width of the surfaces between the belt edges is the same for both sheaves. When they are not equal or when using adjustable pitch pulleys, adjust so that the belts have approximately equal tension. Both shafts should be at right angles to the belt. Check the setscrew and/or bushing bolt tightness.**

Belts tend to stretch somewhat after installation. Recheck belt tension after several hours of operation.

## TROUBLESHOOTING GUIDE

**WARNING:** BE AWARE OF HIGH POWER SITUATIONS WHILE TROUBLESHOOTING. THERE ARE ALSO MOVING BELTS, BLOWERS, AND MOTORS WHILE POWER IS CONNECTED TO THE UNIT. WHEN REACHING INTO ANY OF THE UNIT SECTIONS TO MAKE ADJUSTMENTS TO THE UNIT. PLEASE DISCONNECT POWER FROM THE UNIT.

PROBLEM	CAUSE	DESCRIPTION
Power Lamp (PL) OFF	<ol style="list-style-type: none"> <li>1. No voltage to unit.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check voltage at power supply and check for broken power wires.</li> </ol>
Power Lamp (PL) ON	<ol style="list-style-type: none"> <li>1. No cooling or no blower.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and/or replace defective selector switch.</li> <li>2. Check phase indicator light for correct phasing.</li> <li>3. Check for defective phase monitor.</li> </ol>
Unit Locked in Cooling Mode	<ol style="list-style-type: none"> <li>1. Thermostat incorrectly set.</li> <li>2. Defective thermostat.</li> <li>3. Defective compressor contactor CCR.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check thermostat setting and selector switch mode.</li> <li>2. Replace thermostat.</li> <li>3. Replace compressor contactor CCR.</li> </ol>
No Cooling	<ol style="list-style-type: none"> <li>1. Dirty air filter.</li> <li>2. Check thermostat setting and mode selector switch.</li> <li>3. Defective power wiring to compressor.</li> <li>4. Defective compressor contactor CCR.</li> <li>5. Defective compressor motor</li> <li>6. Compressor won't start.</li> <li>7. Compression pressures almost equalized.</li> <li>8. Condenser motor tripped on overload may have also caused high pressure trip.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean or replace air filters in front of evaporator coil.</li> <li>2. Reset thermostat setting or mode selector switch.</li> <li>3. Check continuity of power wiring.</li> <li>4. Replace compressor contactor CCR.</li> <li>5. Check motor windings for shorts or opens and/or replace compressor if necessary.</li> <li>6. Internal overload opened up. Wait one hour to see if it resets and starts.</li> <li>7. Defective compressor valves. Replace compressor.</li> <li>8. Reset the overload and also check and reset the high pressure switch if required.</li> </ol>
High Pressure Trips	<ol style="list-style-type: none"> <li>1. Condenser air inlet and/or outlets are restricted.</li> <li>2. High-pressure switch open but doesn't reset.</li> <li>3. Defective condenser blower motor.</li> <li>4. Defective condenser blower motor contactor CCR.</li> <li>5. System is over-charged or has non-condensibles.</li> <li>6. Condenser blower v-belts loose, slipping, or broken.</li> </ol>	<ol style="list-style-type: none"> <li>1. Re-locate unit to a place with unobstructed airflow.</li> <li>2. Replace high-pressure switch.</li> <li>3. Replace condenser blower motor.</li> <li>4. Replace defective condenser blower motor contactor CCR.</li> <li>5. Remove some refrigerant. If the high side pressure doesn't start to drop, recover the refrigerant and re-charge with fresh R-410a to correct system charge.</li> <li>6. Re-tighten or replace v-belts.</li> </ol>
Low Pressure Trips	<ol style="list-style-type: none"> <li>1. Supply and return air grills in space are restricted.</li> <li>2. Dirty return air filter.</li> <li>3. Low-pressure switch open and does not reset.</li> <li>4. Defective evaporator blower motor</li> <li>5. Defective evaporator blower motor contactor CEM.</li> <li>6. System might be under charged check sight glass and perform leak checks.</li> <li>7. Expansion valve is sticking or binding.</li> <li>8. Filter drier is dirty or plugged.</li> <li>9. Evaporator blower v-belts loose, slipping, or broken.</li> </ol>	<ol style="list-style-type: none"> <li>1. Re-locate objects in front of air grills or re-locate supply and return air grills in space.</li> <li>2. Clean or replace air filter.</li> <li>3. Replace low-pressure switch.</li> <li>4. Replace evaporator blower motor.</li> <li>5. Replace defective evaporator blower motor contactor CEM.</li> <li>6. Recover refrigerant, repair leaks, re-leak check, evacuate and re-charge to system operating charge</li> <li>7. Replace expansion valve.</li> <li>8. Replace filter drier.</li> <li>9. Re-tighten or replace v-belts.</li> </ol>



NOTES:

1. ALL DIMENSIONS OUTSIDE UNLESS OTHERWISE NOTED

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YORK, PA.		U.S.A.	
<b>KOLDWAVE</b>			
TITLE: OUTLINE DRAWING OF 12-20 TON PORTABLE A/C			
DWN BY:	APP. BY:	SCALE:	NTS
A. KHAN			
DATE:	DATE:	DWG. NO:	REV. LEV.
12/12/02	12/12/02	CA3127	H

REV.	DESCRIPTION	BY	ECN#	DATE
H	CHANGED 91.1 TO 91.63	JTP		09/06/13
G	CORRECTED OVER ALL HEIGHT 94.1 WAS 96.1	AK		8/10/05
F	CHANGED POD DIMENSIONS	AK		12/12/02